

Figure 1

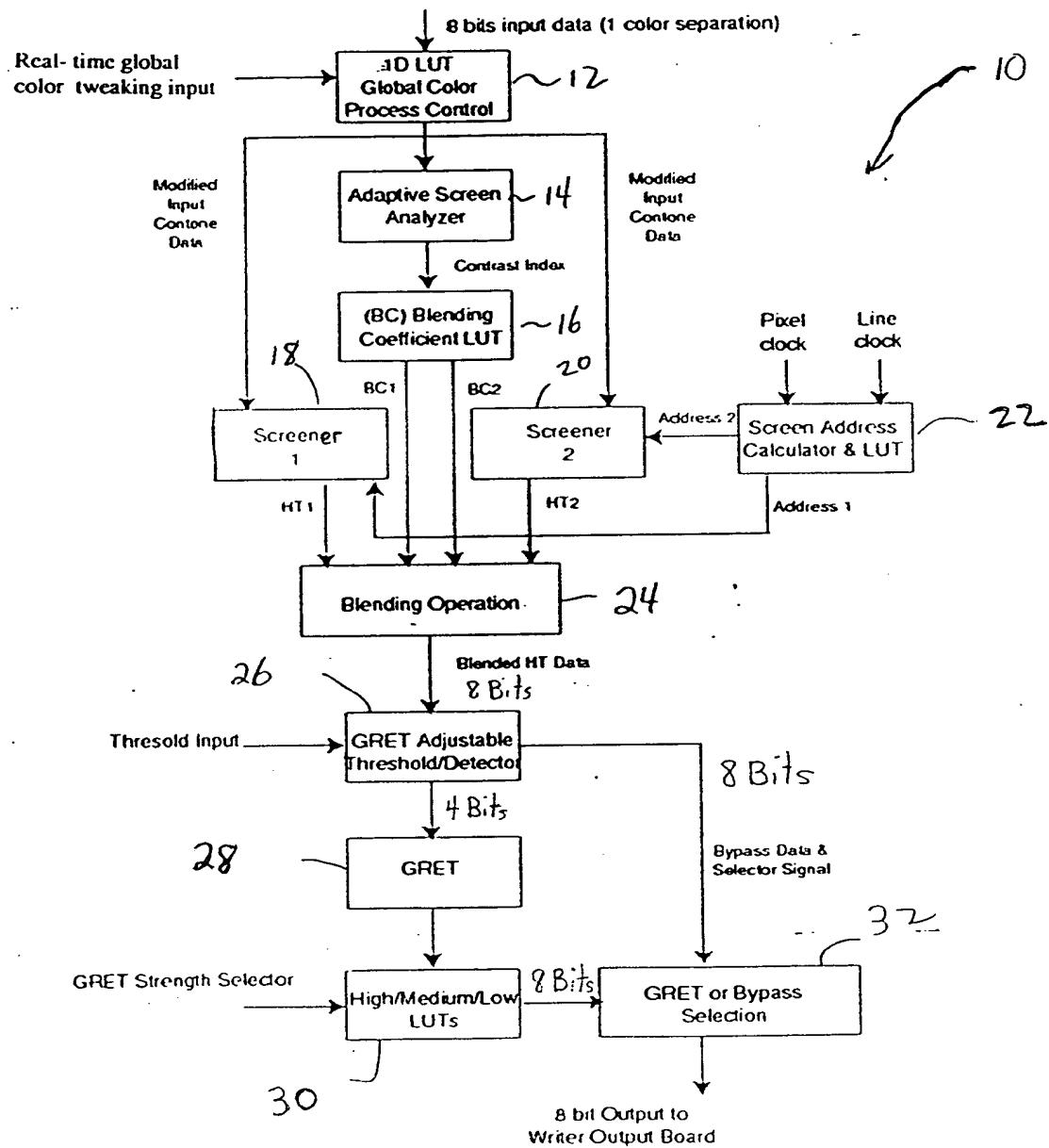
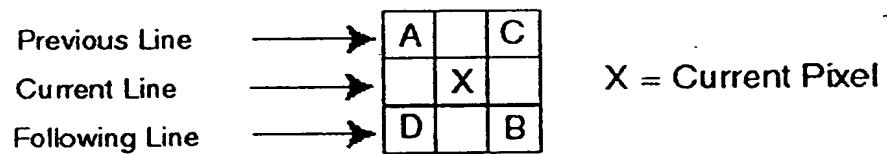
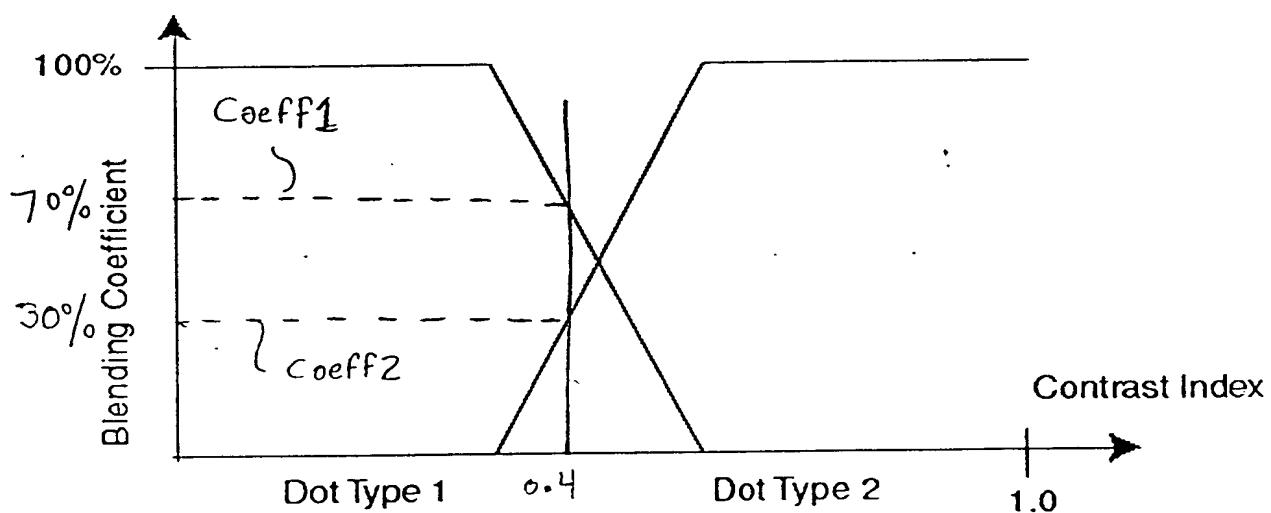


Figure 2



$$\text{Contrast Index} = \text{Max}(|A - B|, |C - D|)$$

Figure 3



$$\text{Rendered Dot Value} = (\text{Dot1_value}) \times \text{Coeff1} + (\text{Dot2_value}) \times \text{Coeff2}$$

$$\text{Coeff1} + \text{Coeff2} = 1.0$$

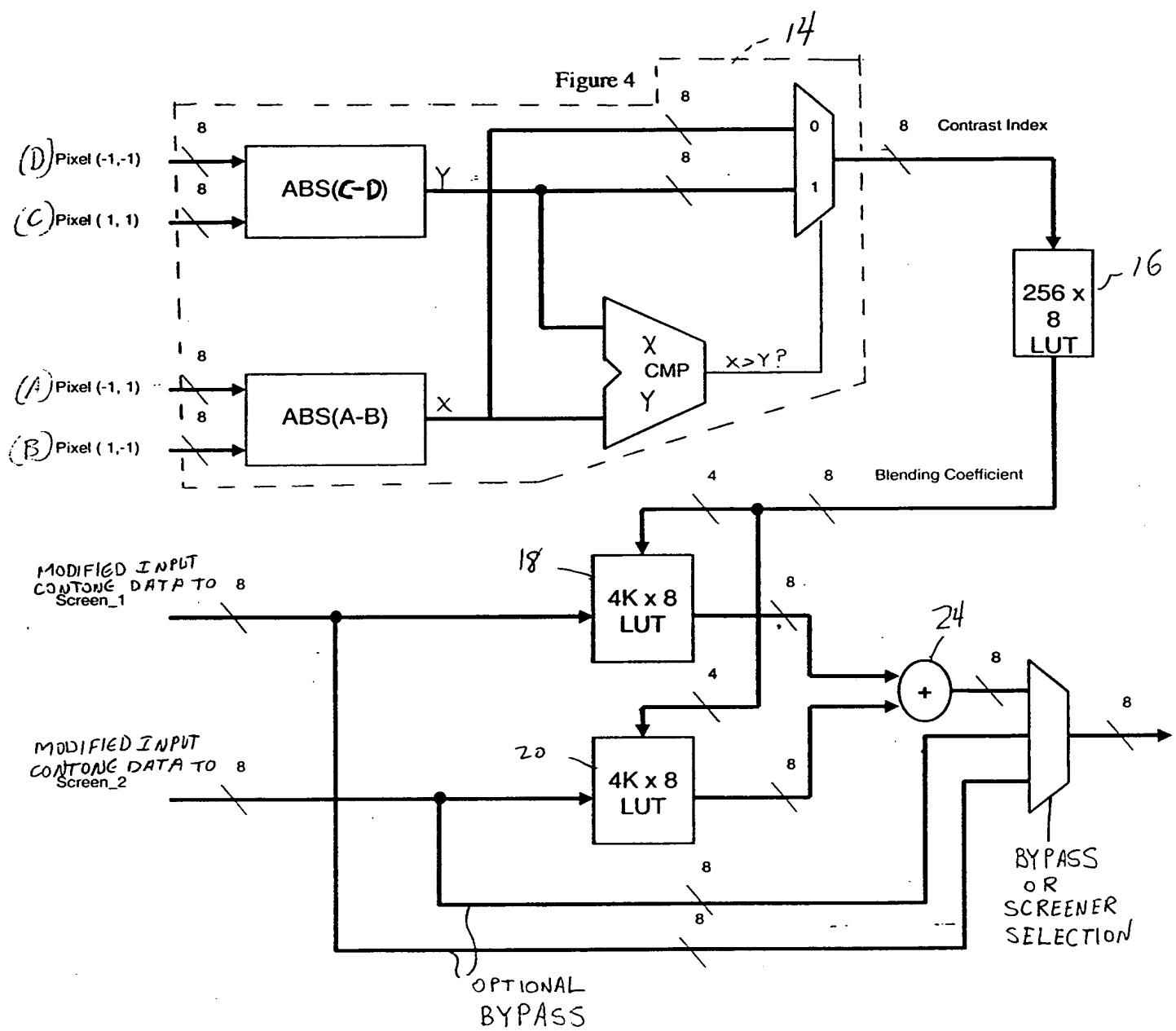
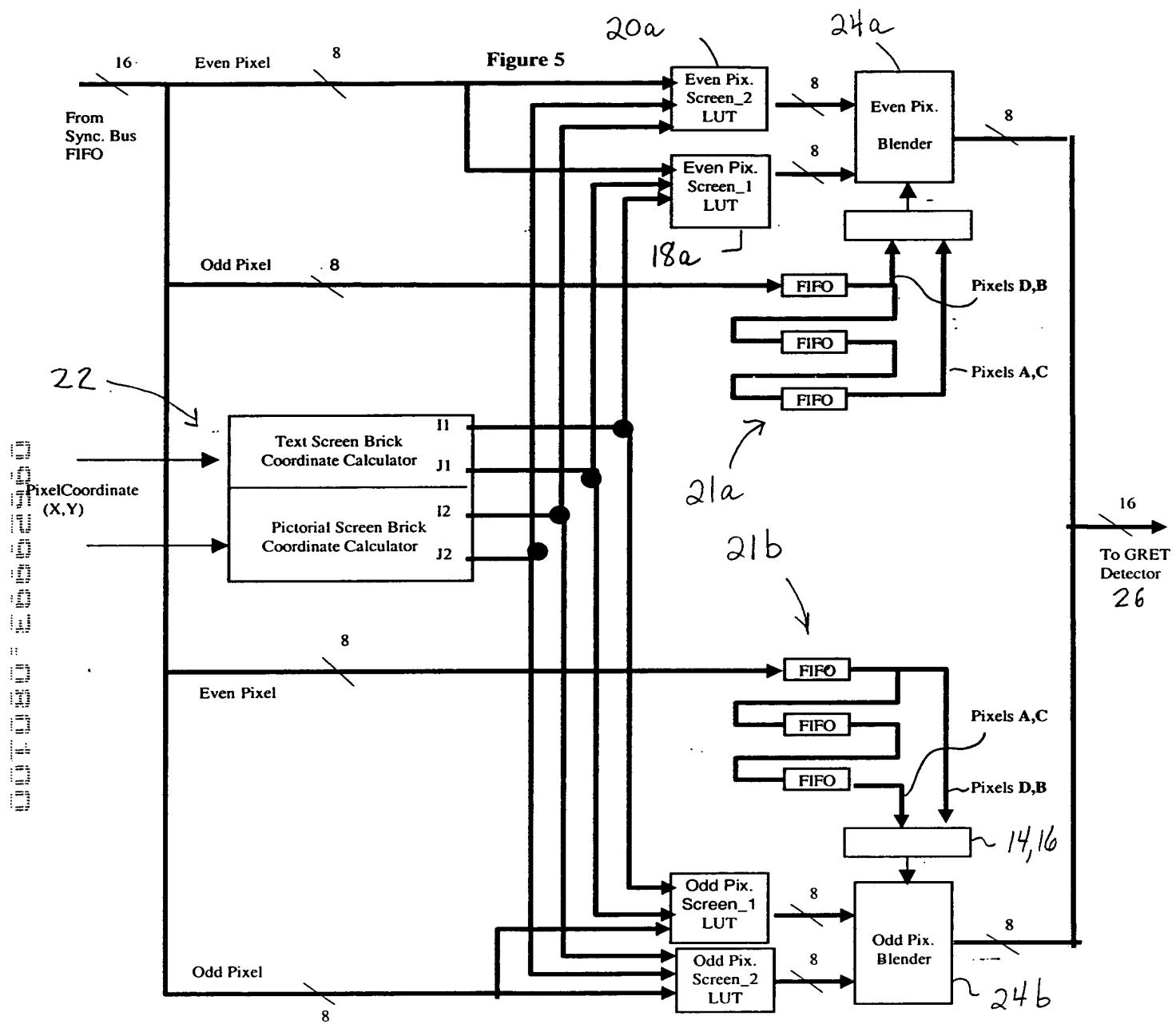


Figure 5



Screen LUT Illustration

Plane = 255	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	
5	0	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	
6	0	0	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	
7	0	0	0	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	
8	0	0	0	0	255	255	255	255	255	255	255	255	255	255	255	255	255	255	
9	0	0	0	0	0	255	255	255	255	255	255	255	255	255	255	255	255	255	
10	0	0	0	0	0	0	255	255	255	255	255	255	255	255	255	255	255	255	
11	0	0	0	0	0	0	0	255	255	255	255	255	255	255	255	255	255	255	
12	0	0	0	0	0	0	0	0	255	255	255	255	255	255	255	255	255	255	
13	0	0	0	0	0	0	0	0	0	255	255	255	255	255	255	255	255	255	
14	0	0	0	0	0	0	0	0	0	0	255	255	255	255	255	255	255	255	
15	0	0	0	0	0	0	0	0	0	0	0	255	255	255	255	255	255	255	
16	0	0	0	0	0	0	0	0	0	0	0	0	255	255	255	255	255	255	
17	0	0	0	0	0	0	0	0	0	0	0	0	0	255	255	255	255	0	
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Fig. 6 (a)

Plane=	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	0	32	187	83	32	163	253	228	155	202	248	132	0	54	168	32	0	0	
5	0	117	248	241	168	182	243	181	22	27	152	70	0	13	182	163	70	0	
6	0	166	233	219	54	13	117	116	0	0	134	194	81	117	243	253	182	0	
7	0	0	86	156	0	0	81	212	104	86	225	255	212	116	181	228	57	0	
8	0	0	40	209	132	70	194	255	235	126	157	235	104	0	22	155	48	0	
9	0	0	155	253	248	152	134	225	164	0	0	133	86	0	27	202	204	120	
10	0	0	120	204	202	27	0	86	133	0	0	164	225	134	152	248	253	155	
11	0	0	0	48	155	22	0	104	235	157	126	235	255	194	70	132	209	40	
12	0	0	0	57	228	181	116	212	255	225	86	104	212	81	0	0	156	86	
13	0	0	0	0	182	253	243	117	81	194	134	0	0	116	117	13	54	219	
14	0	0	0	0	70	163	182	13	0	70	152	27	22	181	243	182	168	241	
15	0	0	0	0	0	32	168	54	0	132	248	202	155	228	253	163	32	83	
16	0	0	0	0	0	83	241	219	156	209	253	204	48	57	182	70	0	0	
17	0	0	0	0	0	187	248	233	86	40	155	120	0	0	0	0	0	0	
18	0	0	0	0	0	32	117	166	0	0	0	0	0	0	0	0	0	0	

Fig. 6 (b)

Plane=

2

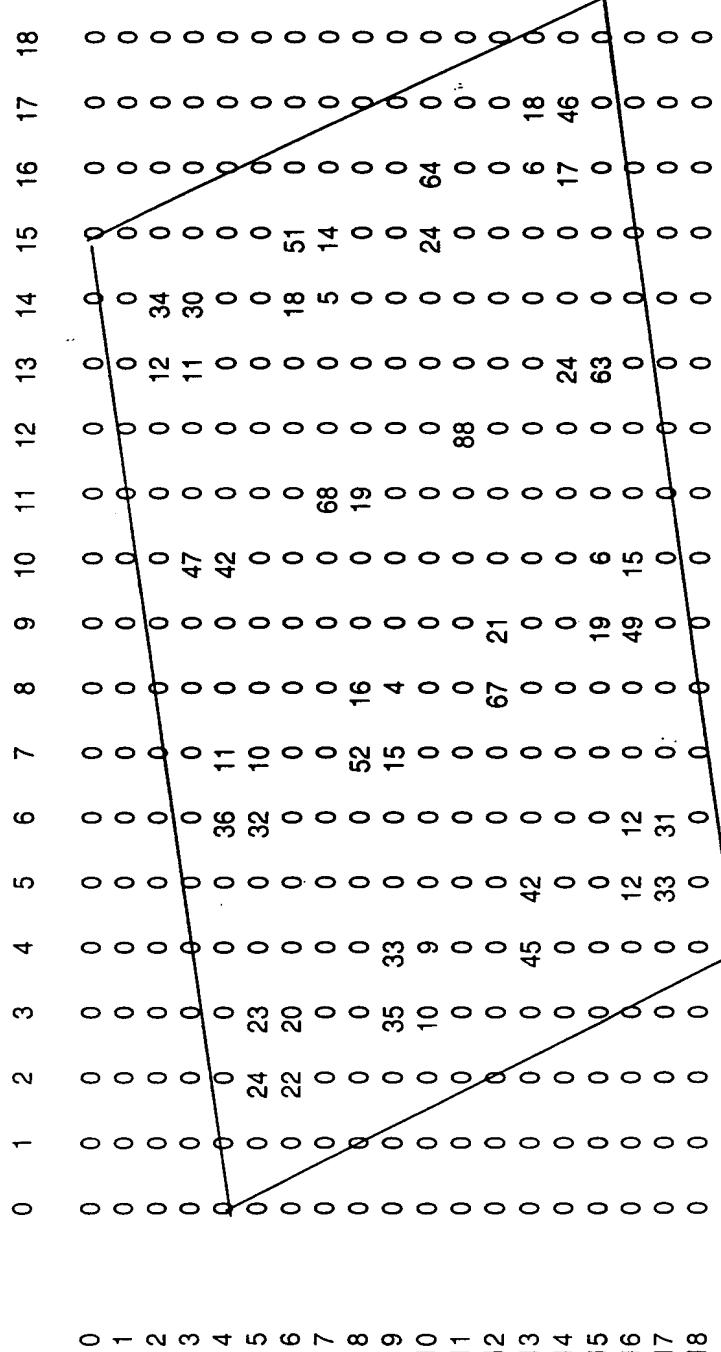


Fig 6 (c)

Example of 19x19 size of screen tile

(Screen ruling : 154.6 LPI Screen Angle : 14.93)

- 1. Brick Width = 241
- 2. Brick Height = 1

3. Brick Offset = 177

Fig. 7.(a)

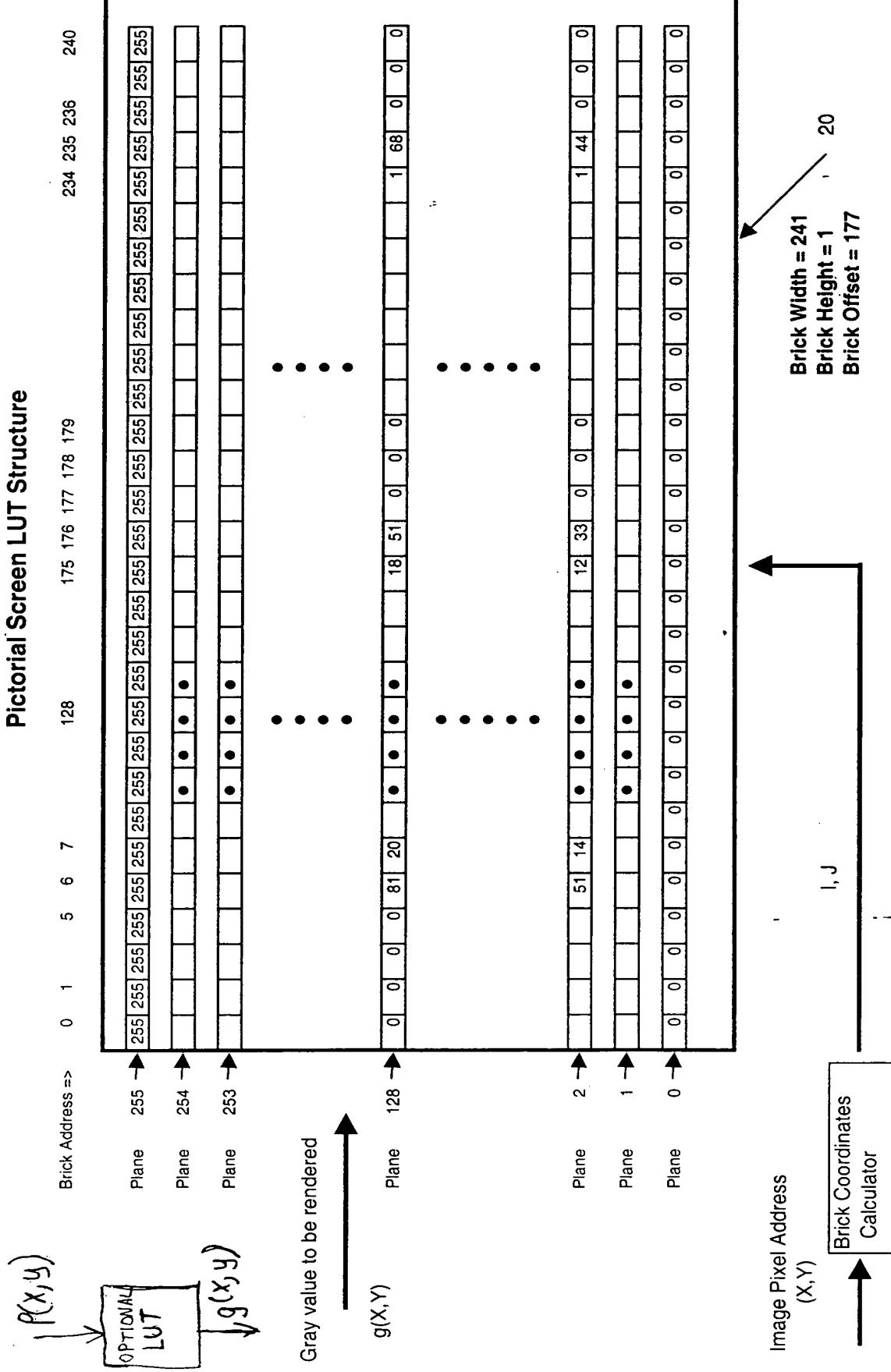
Plane 128

Fig. 7(b)

Plane 2

Fig. 7(c)

Pictorial Screen LUT Structure



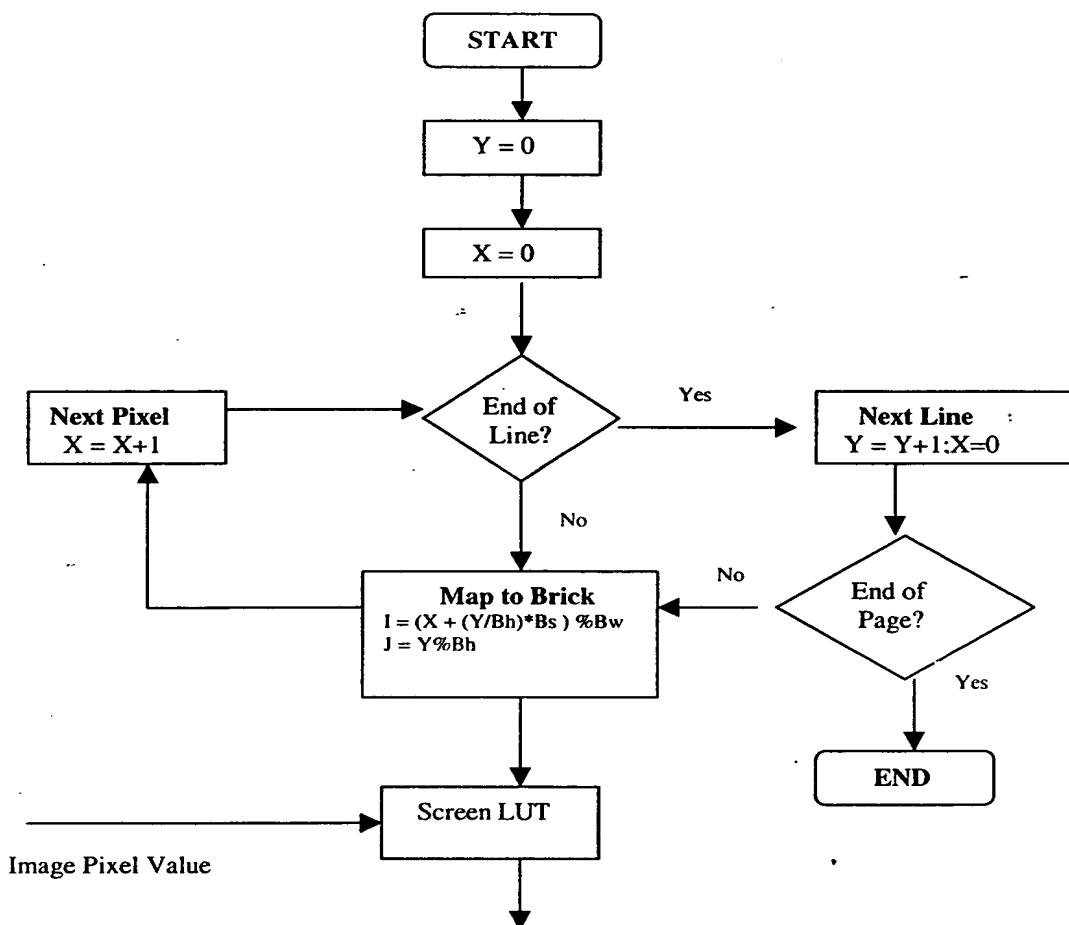


Figure: Screening Operation Flow Diagram
 (X, Y: Image Pixel address; I, J: Brick address)
 (Bw: Brick width; Bh: Brick height; Bs: Brick offset)

Fig. 9

Example of 2x2 size of Text screen tile

1. Brick Width = 2

2. Brick Height = 2

3. Brick Offset = 0

Screen Angle : 0)

Plane 255

255	255
255	255

Plane 128

127	128
128	128

Plane 2

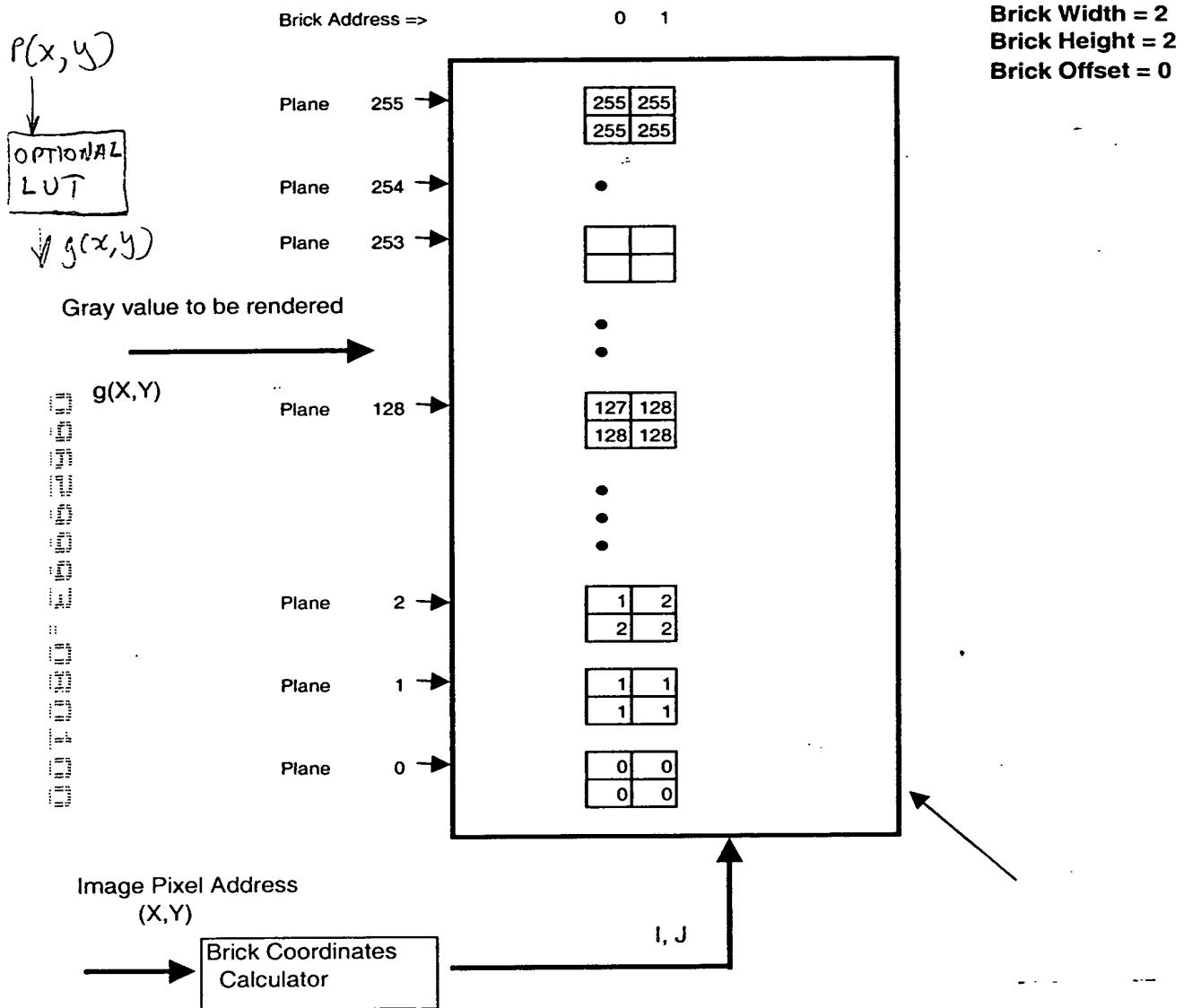
1	2
2	2

Fig. 10

127 128
128 128

1 2
2 2

Text Screen LUT Structure



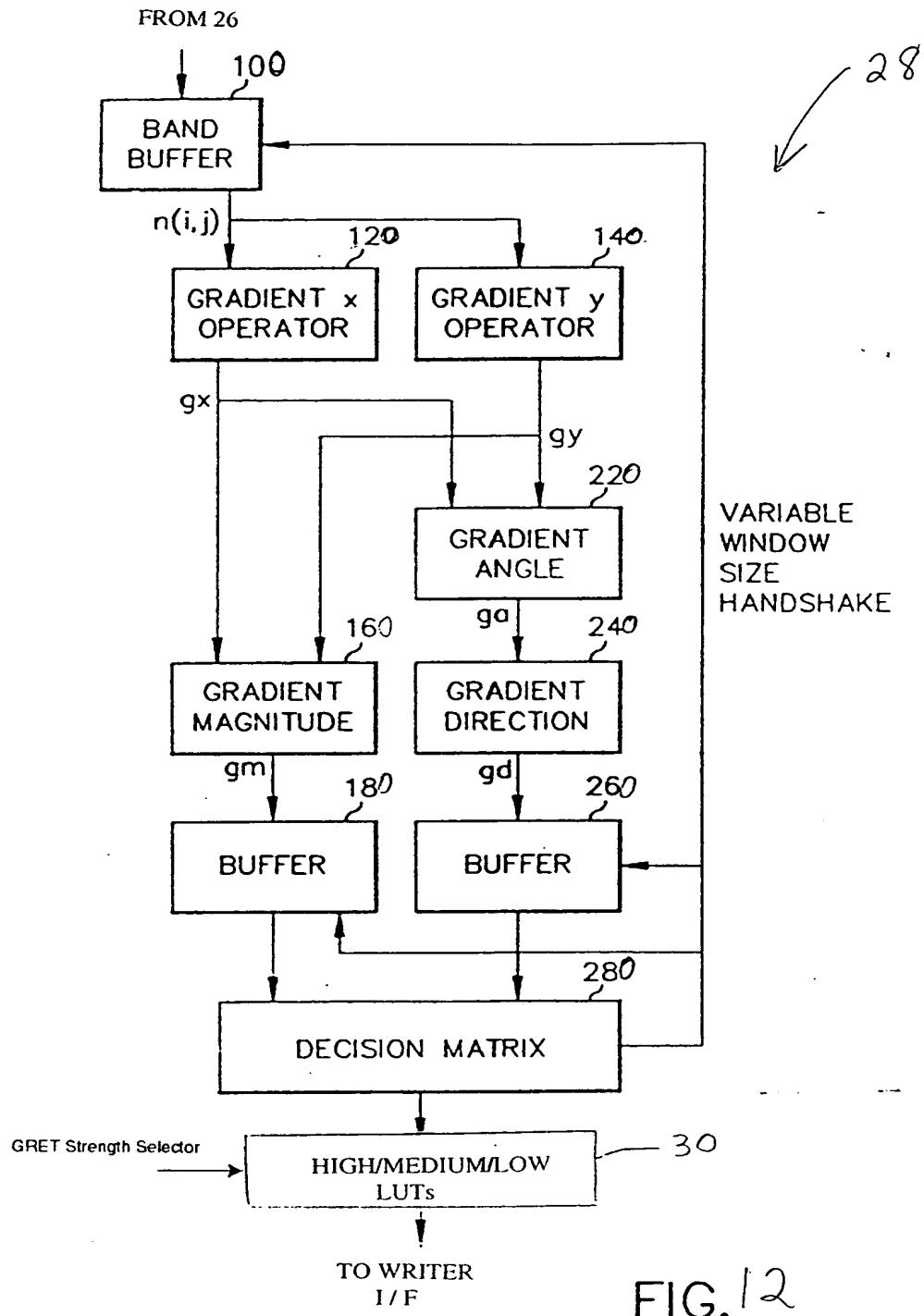


FIG. 12

	Medium	High	Low
0	0	0	0
1	17	33	4
2	34	56	12
3	51	76	23
4	68	95	35
5	85	106	65
6	102	123	81
7	119	139	98
8	136	154	111
9	153	169	135
10	170	184	154
11	187	199	173
12	204	213	193
13	221	227	213
14	238	241	234
15	255	255	255

Illustration of Output LUT (Low/Medium/High)

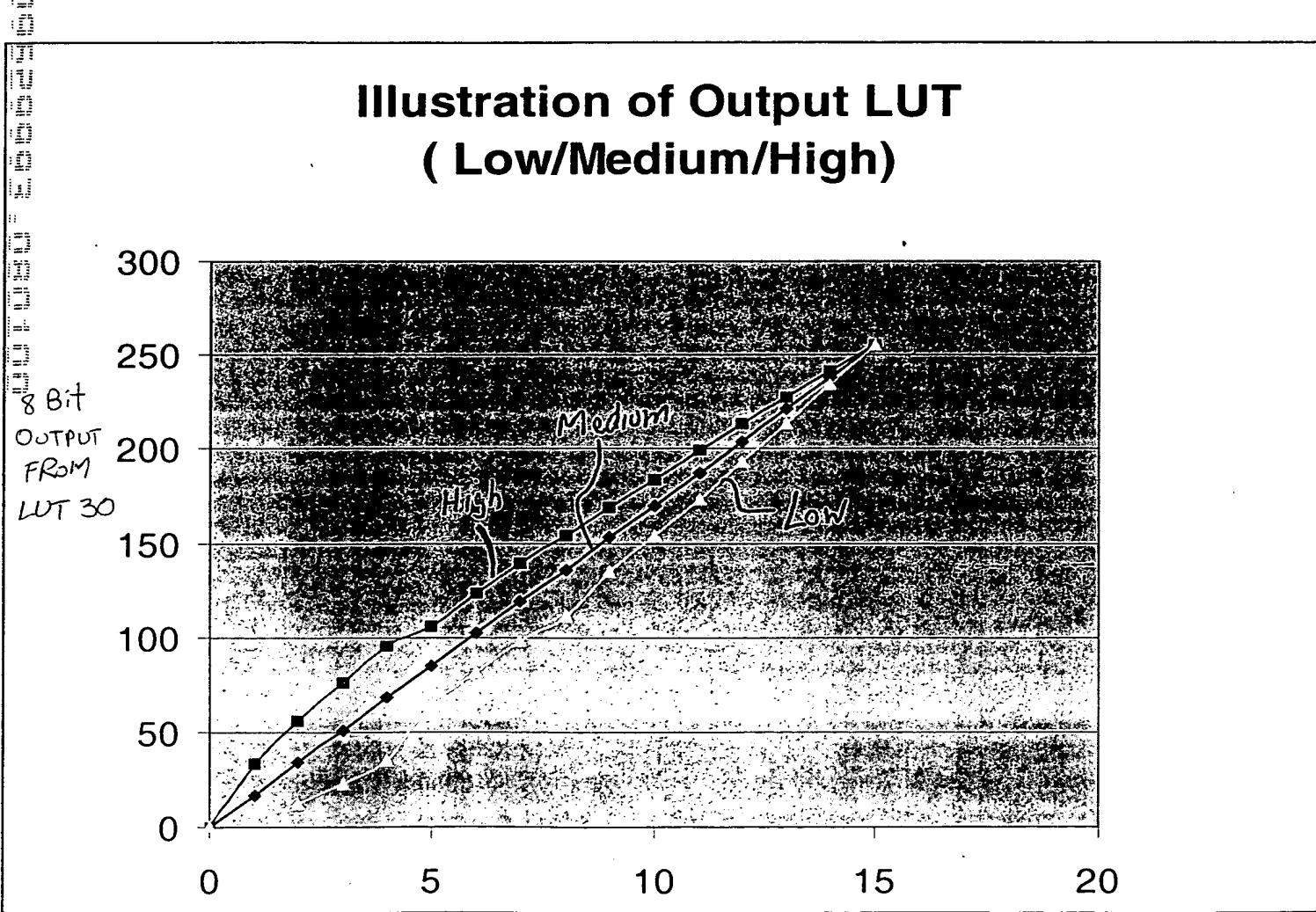


Fig.13

Original Image

Fig. 14

GR3T Output with LUT: Medium strength

Fig. 15

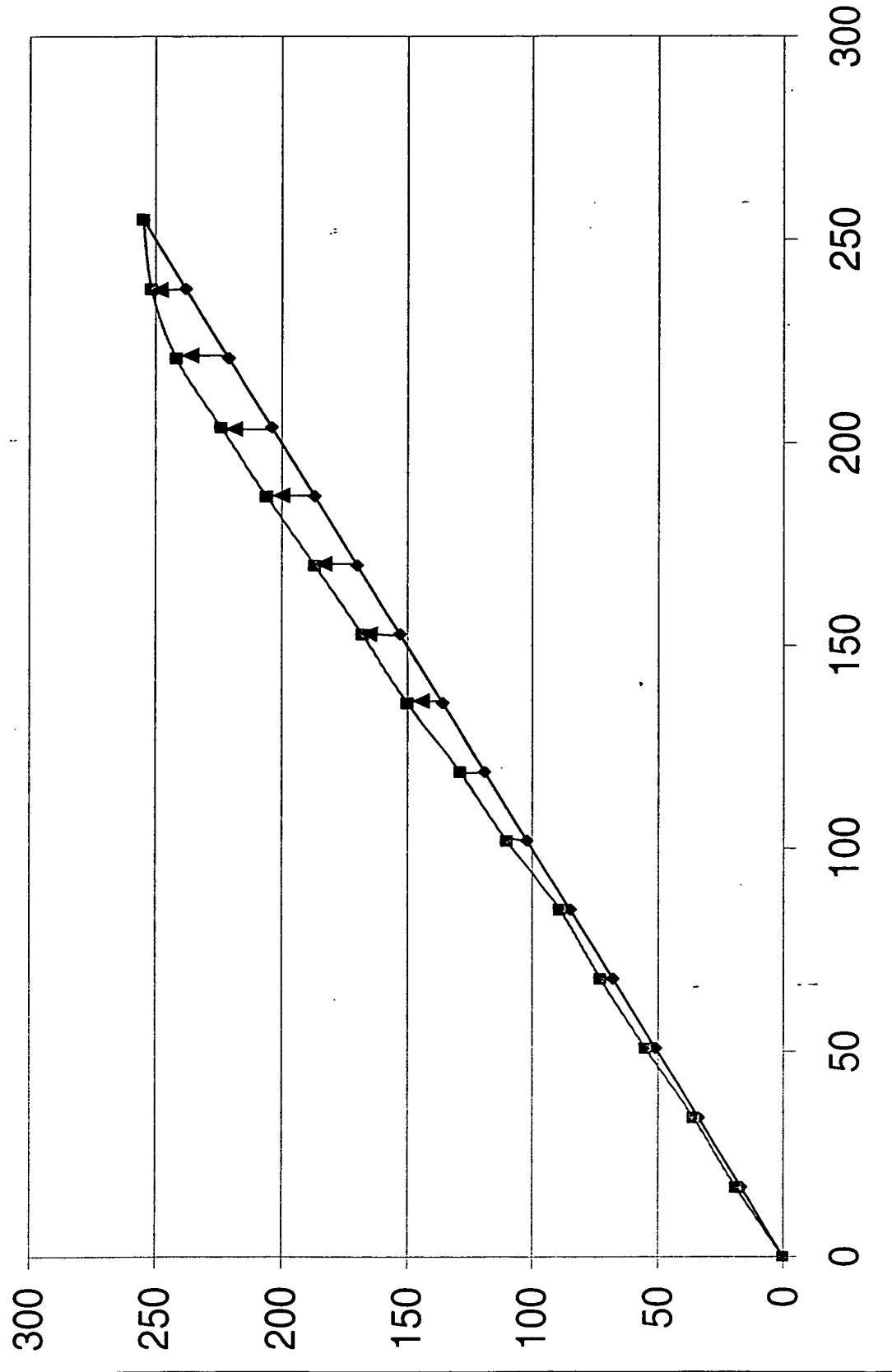
GREIT Output with LUT: Low strength

Fig. 16.

GR7 Output with LUT: High strength

Fig. 17

Color Tweaking Curve



Gray Level In Fig.18

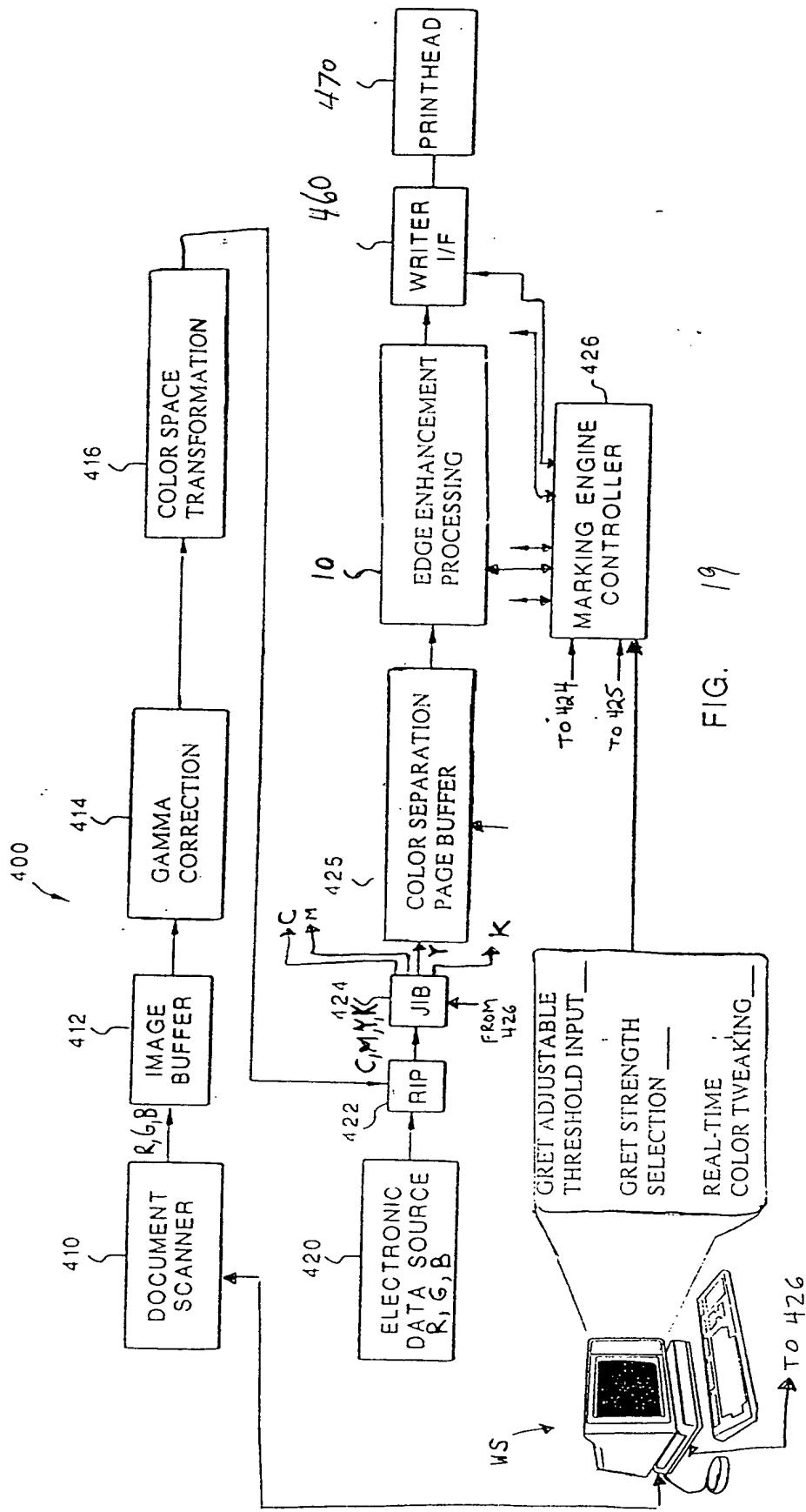


FIG. 19

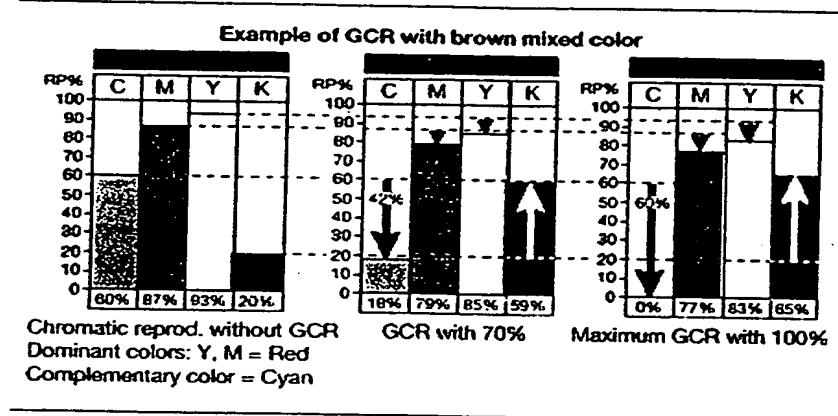


Fig. 20(a)

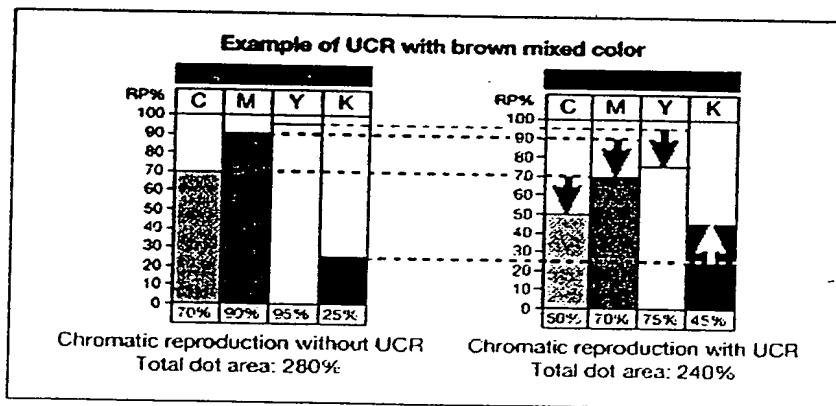


Fig. 20(b)

Illustration of tile structure and brick structure

Screen example: 141 LPI@600 dpi, 45 degree

Step1: Tile structure

x	x	x	x	x	x	x	x
x	x	x	C1	x	x	x	x
x	x	C1	C1	C1	x	x	x
x	C1	C1	C1	C1	C1	x	x
x	C1	C1	C1	C1	C1	x	x
x	x	C1	C1	C1	x	x	x
x	x	x	C1	x	x	x	x
x	x	x	0	x	x	x	x

Screen Tile Information:

1. Single cell C1 with one tile
2. Screen Angle = 45 degree
3. Screen ruling = 141 LPI @ 600 dpi

Fig-21-1

Step2:

Label pixel sequence in the tile

0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0
0	0	2	3	4	0	0	0
0	5	6	7	8	9	0	0
0	10	11	12	13	14	0	0
0	0	15	16	17	0	0	0
0	0	0	18	0	0	0	0
0	0	0	0	0	0	0	0

Fig- 21-2

Step3:

Fill up image Plane with tile

1	10	11	12	13	14	1	10	11	12	13	14	1
3	4	15	16	17	2	3	4	15	16	17	2	3
7	8	9	18	5	6	7	8	9	18	5	6	7
12	13	14	1	10	11	12	13	14	1	10	11	12
16	17	2	3	4	15	16	17	2	3	4	15	16
18	5	6	7	8	9	18	5	6	7	8	9	18
1	10	11	12	13	14	1	10	11	12	13	14	1
3	4	15	16	17	2	3	4	15	16	17	2	3
7	8	9	18	5	6	7	8	9	18	5	6	7
12	13	14	1	10	11	12	13	14	1	10	11	12
16	17	2	3	4	15	16	17	2	3	4	15	16
18	5	6	7	8	9	18	5	6	7	8	9	18
1	10	11	12	13	14	1	10	11	12	13	14	1
3	4	15	16	17	2	3	4	15	16	17	2	3
7	8	9	18	5	6	7	8	9	18	5	6	7
12	13	14	1	10	11	12	13	14	1	10	11	12
16	17	2	3	4	15	16	17	2	3	4	15	16

Fig- 21-3

Step 4: Found repeating rectangle blocks in the image plane

1	10	11	12	13	14	1	10	11	12	13	14	1
3	4	15	16	17	2	3	4	15	16	17	2	3
7	8	9	18	5	6	7	8	9	18	5	6	7
12	13	14	1	10	11	12	13	14	1	10	11	12
16	17	2	3	4	15	16	17	2	3	4	15	16
18	5	6	7	8	9	18	5	6	7	8	9	18
1	10	11	12	13	14	1	10	11	12	13	14	1
3	4	15	16	17	2	3	4	15	16	17	2	3
7	8	9	18	5	6	7	8	9	18	5	6	7
12	13	14	1	10	11	12	13	14	1	10	11	12
16	17	2	3	4	15	16	17	2	3	4	15	16
18	5	6	7	8	9	18	5	6	7	8	9	18
1	10	11	12	13	14	1	10	11	12	13	14	1
3	4	15	16	17	2	3	4	15	16	17	2	3
7	8	9	18	5	6	7	8	9	18	5	6	7
12	13	14	1	10	11	12	13	14	1	10	11	12
16	17	2	3	4	15	16	17	2	3	4	15	16

Fig. 21-4

Step 5: Brick structure formed

$T(I_0, J_0)$	$BW = M - I_0$	$T(M, J_0)$
$Bh = N - J_0$		
$T(L, N)$	$<---- \text{offset} ---->$	$T(L, N)$

$\left(\begin{array}{cccccc} 1 & 10 & 11 & 12 & 13 & 14 \\ 3 & 4 & 15 & 16 & 17 & 2 \\ 7 & 8 & 9 & 18 & 5 & 6 \end{array} \right)$

Brick information

1. Brick width = 6 $\approx BW$
2. Brick Height = 3 $\approx Bh$
3. Brick Offset = 3 $\approx BS$

$\left(\begin{array}{cccccc} 1 & 10 & 11 & 12 & 13 & 14 \\ 3 & 4 & 15 & 16 & 17 & 2 \\ 7 & 8 & 9 & 18 & 5 & 6 \end{array} \right)$

Fig. 21-5

$$BS = L - I_0$$

Step 6: Converts 3-D LUT Table structure to 3-D LUT Brick structure

Level 0

♦

♦

Level 2

106	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

♦

♦

♦

♦

♦

♦

Level 128

255	231	0	0	0	231
255	231	0	0	0	231
220	99	99	220	100	100

♦

♦

♦

♦

♦

♦

Level 255

255	255	255	255	255	255
255	255	255	255	255	255
255	255	255	255	255	255

Fig. 21-6

Flow chart to construct Brick

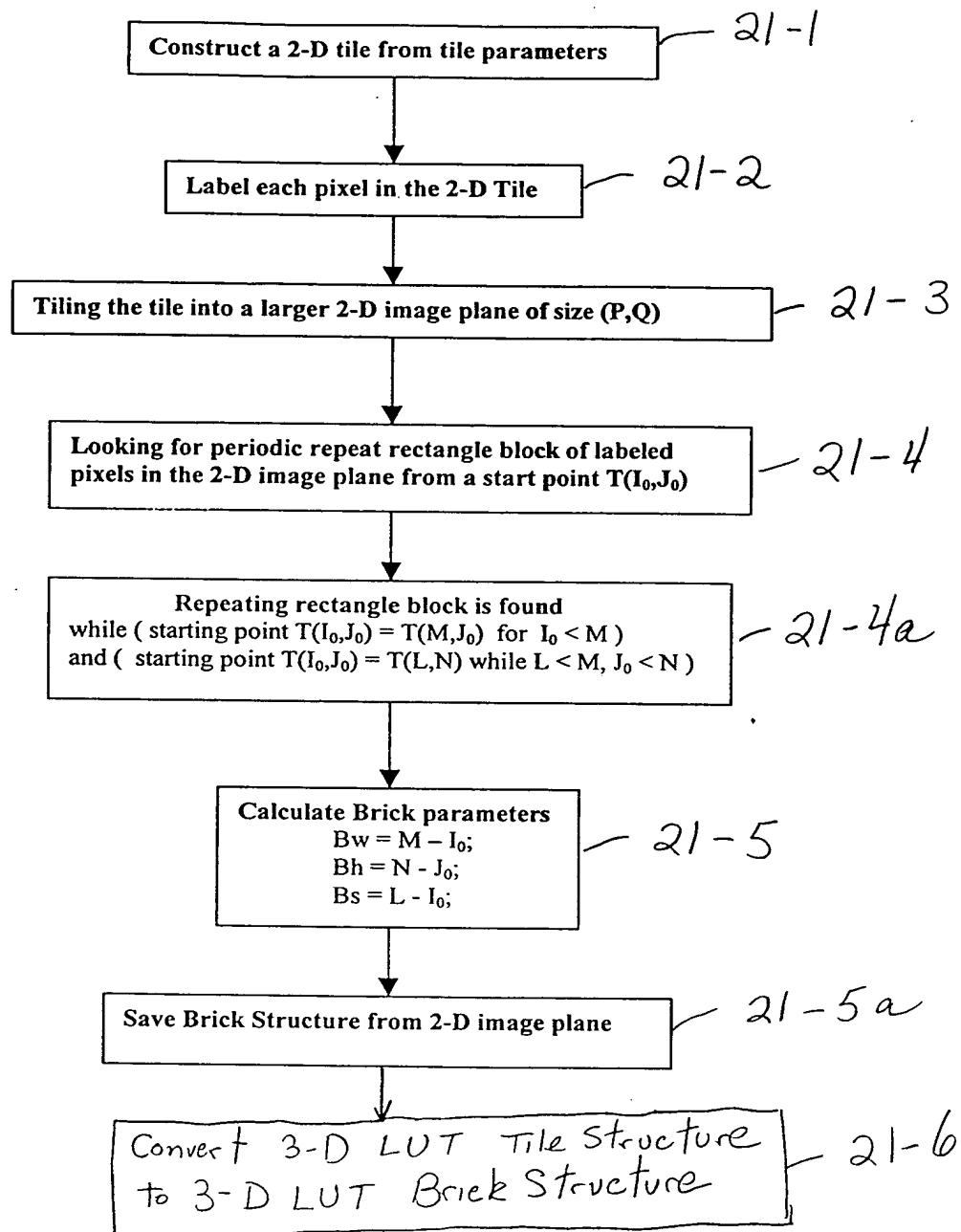


Fig. 22

Screen #2: 171 lpi, 0 degree

Tile structure

C1	C1	C1	C1	C2	C2	C2
C1	C1	C1	C1	C2	C2	C2
C1	C1	C1	C1	C2	C2	C2
C3	C3	C3	C3	C2	C2	C2
C3	C3	C3	C3	C4	C4	C4
C3	C3	C3	C3	C4	C4	C4
C3	C3	C3	C3	C4	C4	C4

Screen Information:

1. Four cells (C1,C2,C3,C4) with one tile
2. Each cell has different shapes
3. Different cell sizes among cells
4. Screen Angle = 0 degree
5. Screen ruling = 171 LPI @ 600dpi
6. Brick width = 7
7. Brick Height = 7
8. Brick Offset = 0

Brick structure

S1	E1	S1	E1
S2	E2	S2	E2
S3	E3	S3	E3
S4	E4	S4	E4
S5	E5	S5	E5
S6	E6	S6	E6
S7	E7	S7	E7
S1	E1	S1	E1
S2	E2	S2	E2
S3	E3	S3	E3
S4	E4	S4	E4
S5	E5	S5	E5
S6	E6	S6	E6
S7	E7	S7	E7

S1,S2,..S7 : start of brick pixel

E1,E2,..E7: end of brick pixel

Fig. 23 (a)

Screen #2: 171 lpi, 0 degree

Gray level = 2

0	0	0	0	0	0	0	0
0	31	18	0	7	42	0	0
0	15	8	0	3	20	0	0
0	0	0	0	0	0	0	0
0	8	5	0	2	11	0	0
0	38	21	0	8	51	0	0
0	0	0	0	0	0	0	0

Dot type: distributed dot type

Brick structure

0	0	0	0	0	0	0
0	31	18	0	7	42	0
0	15	8	0	3	20	0
0	0	0	0	0	0	0
0	8	5	0	2	11	0
0	38	21	0	8	51	0
0	0	0	0	0	0	0

1. Brick width = 7
2. Brick Height = 7
3. Brick Offset = 0

Fig. 23(b)

Screen #2: 171 lpi, 0 degree

Gray level = 128

20	164	83	5	83	164	20
164	255	229	132	223	255	164
83	229	163	51	159	233	83
5	132	51	0	51	132	5
83	223	159	51	158	224	83
164	255	233	132	224	255	164
20	164	83	5	83	164	20

Dot type: distributed dot type

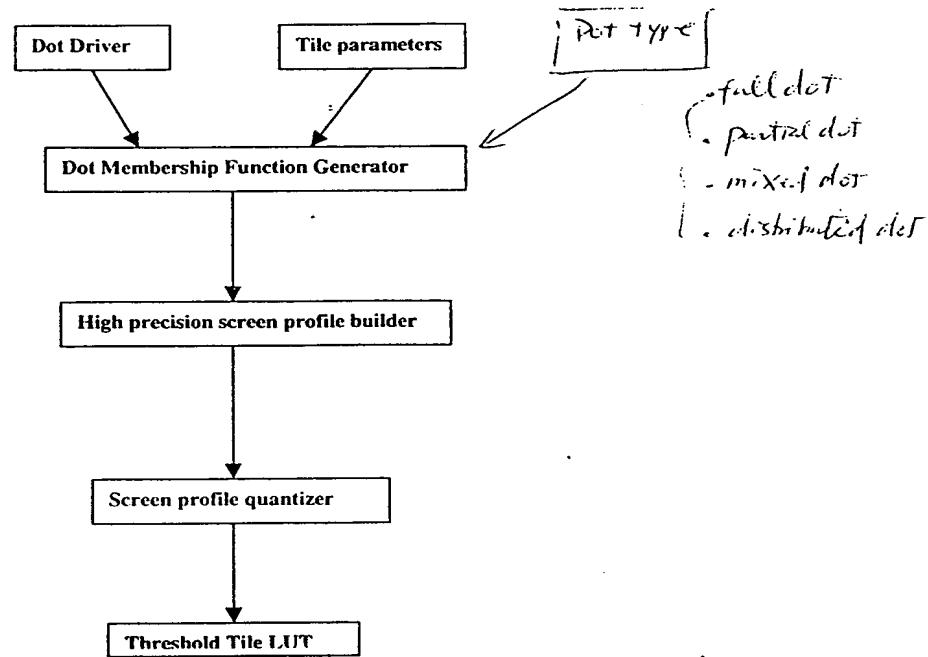
Brick structure

20	164	83	5	83	164	20
164	255	229	132	223	255	164
83	229	163	51	159	233	83
5	132	51	0	51	132	5
83	223	159	51	158	224	83
164	255	233	132	224	255	164
20	164	83	5	83	164	20

1. Brick width = 7
2. Brick Height = 7
3. Brick Offset = 0

Fig. 23(c)

Flow Chart to Construct a Threshold LUT of a Tile



16x16 dot size Driver

256	245	240	224	204	168	136	92	85	129	161	195	219	233	250	255
252	244	232	208	188	160	116	84	73	109	153	181	209	229	241	248
236	228	216	192	176	144	108	80	69	101	137	169	197	213	225	237
217	212	200	180	152	120	100	63	55	93	121	145	177	189	205	221
193	184	172	148	128	58	46	39	35	51	67	125	149	173	185	201
164	156	140	124	66	42	30	22	19	31	43	59	117	141	157	165
132	112	104	96	50	26	14	6	11	15	27	47	97	105	113	133
88	76	72	54	34	18	10	4	3	8	23	37	61	77	81	89
90	82	78	62	38	24	7	2	1	12	17	33	53	70	74	87
134	114	106	98	48	28	16	9	5	13	25	49	95	103	111	131
166	158	142	118	60	44	32	20	21	29	41	65	123	139	155	163
202	186	174	150	126	68	52	36	40	45	57	127	147	171	183	194
222	206	190	178	146	122	94	56	64	99	119	151	179	199	211	218
238	226	214	198	170	138	102	71	79	107	143	175	191	215	227	235
246	242	230	210	182	154	110	75	83	115	159	187	207	231	243	251
254	249	234	220	196	162	130	86	91	135	167	203	223	239	247	253

Fig. 24